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Su

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[54] **PAD LOCKS WITH CHANGEABLE CODE NUMBER**

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[51] **Int. Cl.**[7] **E05B 37/06**

[52] **U.S. Cl.** **70/22**; 70/28; 70/312

[58] **Field of Search** 70/22, 24, 27–29, 70/308, 311, 312, 314–319

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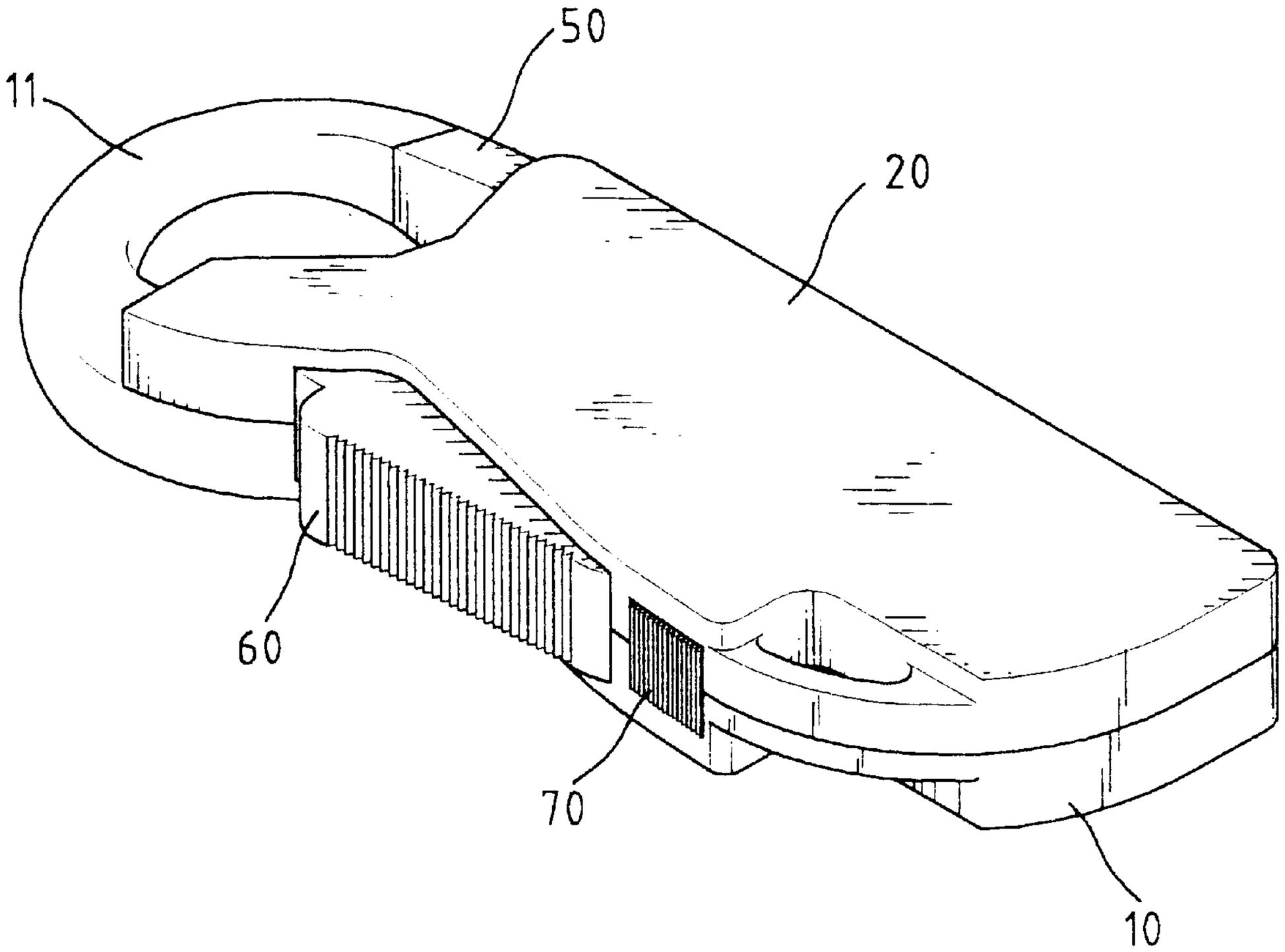
Primary Examiner—Suzanne Dino Barrett
Attorney, Agent, or Firm—Charles E. Baxley

[57] **ABSTRACT**

A pad lock includes a casing including a hook extended outwards therefrom and several number wheels rotatably mounted in the casing. Each number wheel is partially exposed outside the casing for manual turning. Each number wheel includes a code wheel releasably engaged thereto to rotate therewith. A locking device is mounted in the casing and movable between a first position that retains the code wheels in place to allow free rotational movements of the number wheels for code number changing and a second position that disengages from the code wheels such that each code wheel is engaged with an associated number wheel to rotate therewith. An unlocking device includes a pivotal end pivotally mounted in the casing, a press end located outside the casing for manual pressing, an actuating end located in the casing and engaged with the locking device to move therewith, and a latch end located outside the casing and releasably engaged with the hook. A code-changing button has an outer end outside the casing for manual pressing and an inner end releasably engaged with the locking device to retain the locking device in the first position. The code-changing button is retained in a position that engages with and thus retains the locking device in the first position.

1 Claim, 8 Drawing Sheets



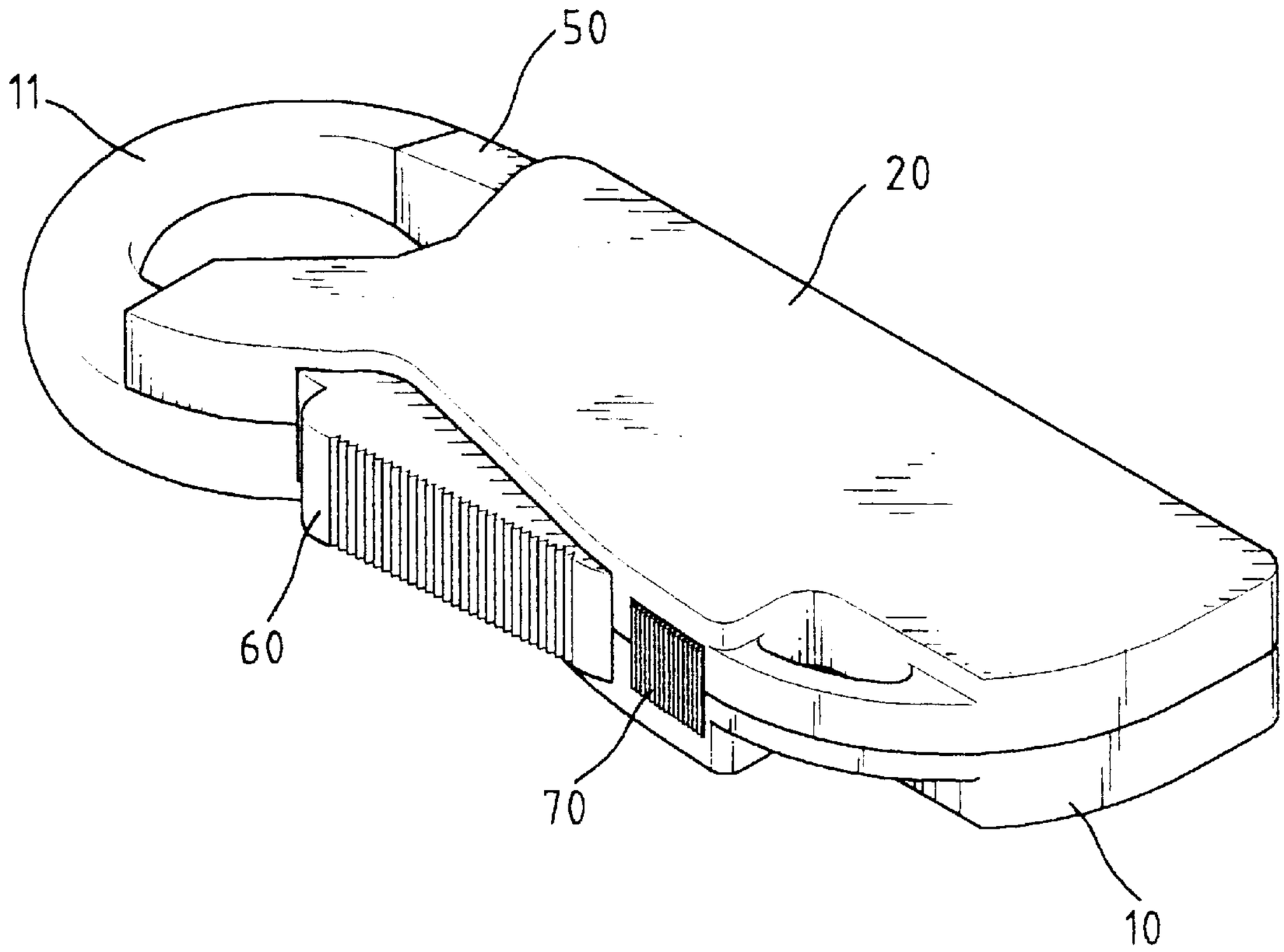


Fig 1

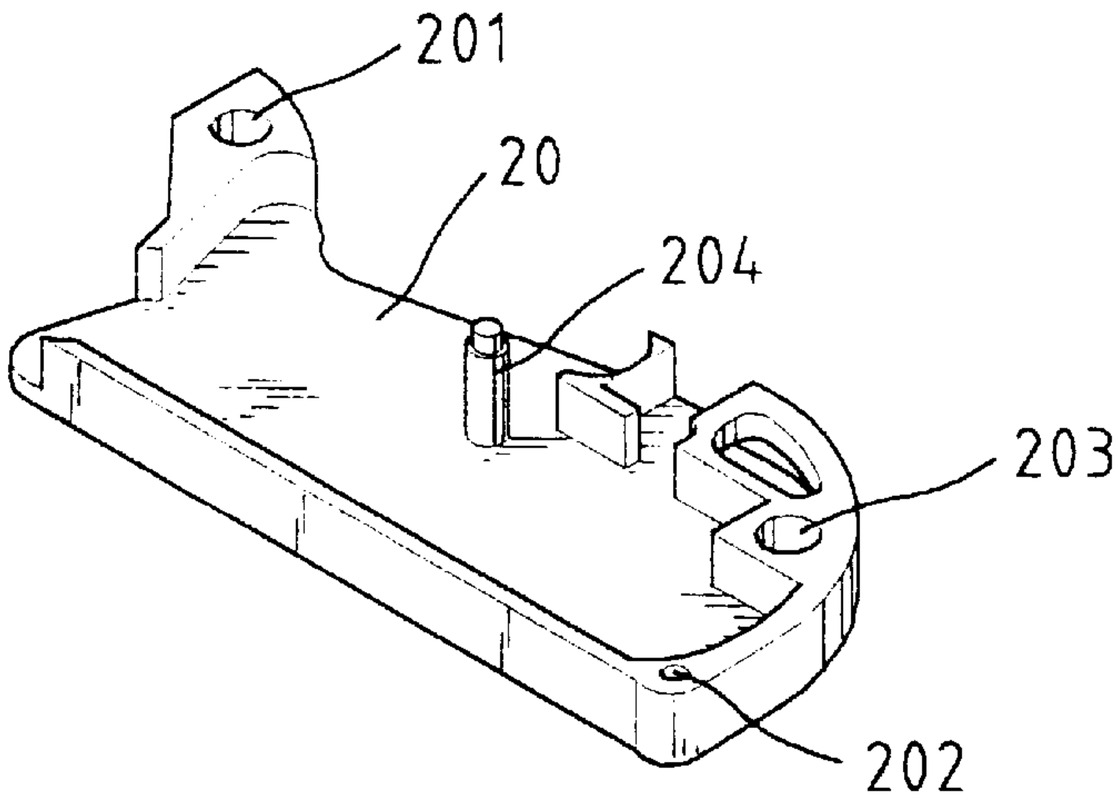


Fig 2A

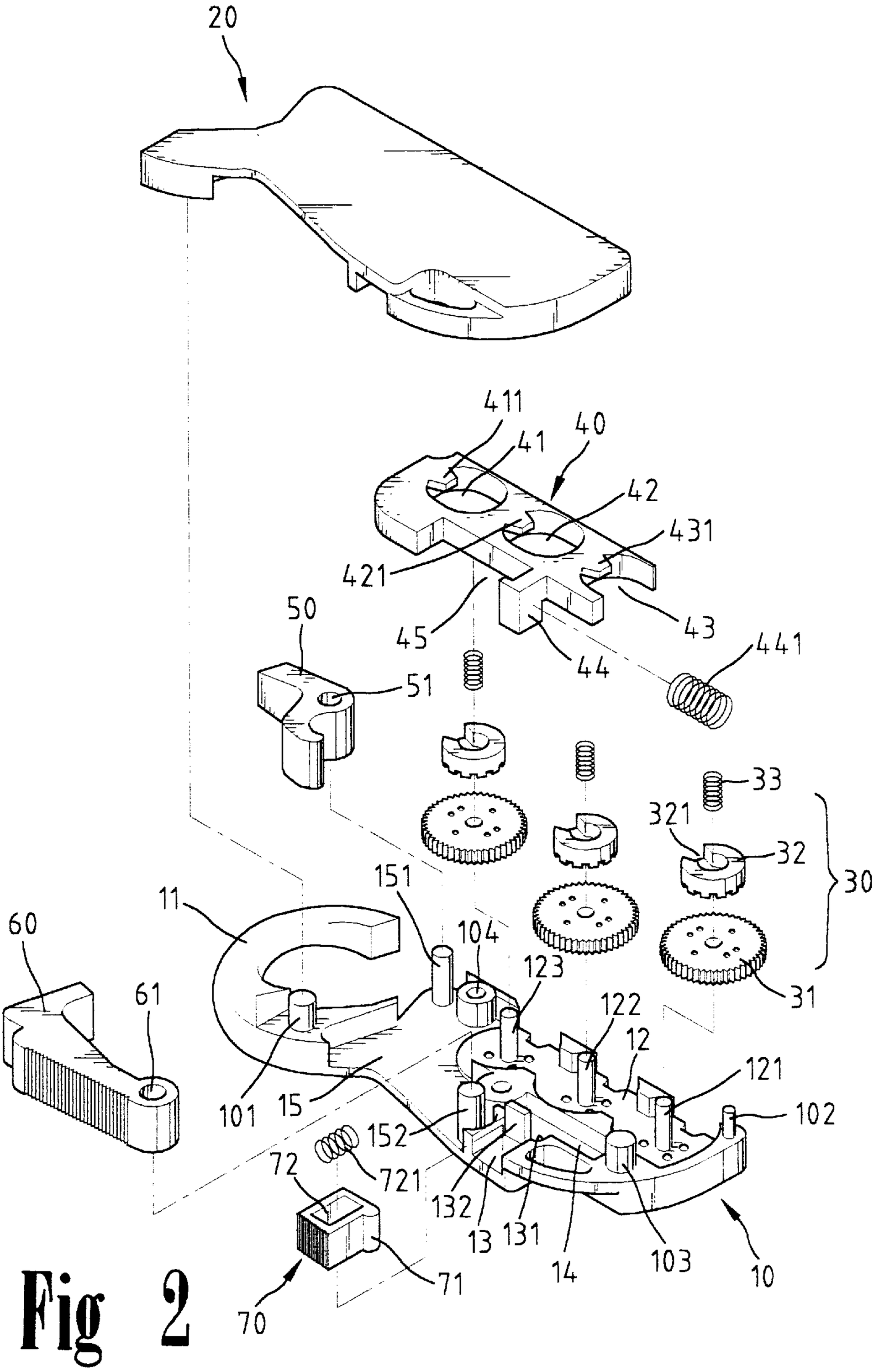

20
411
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Fig 2

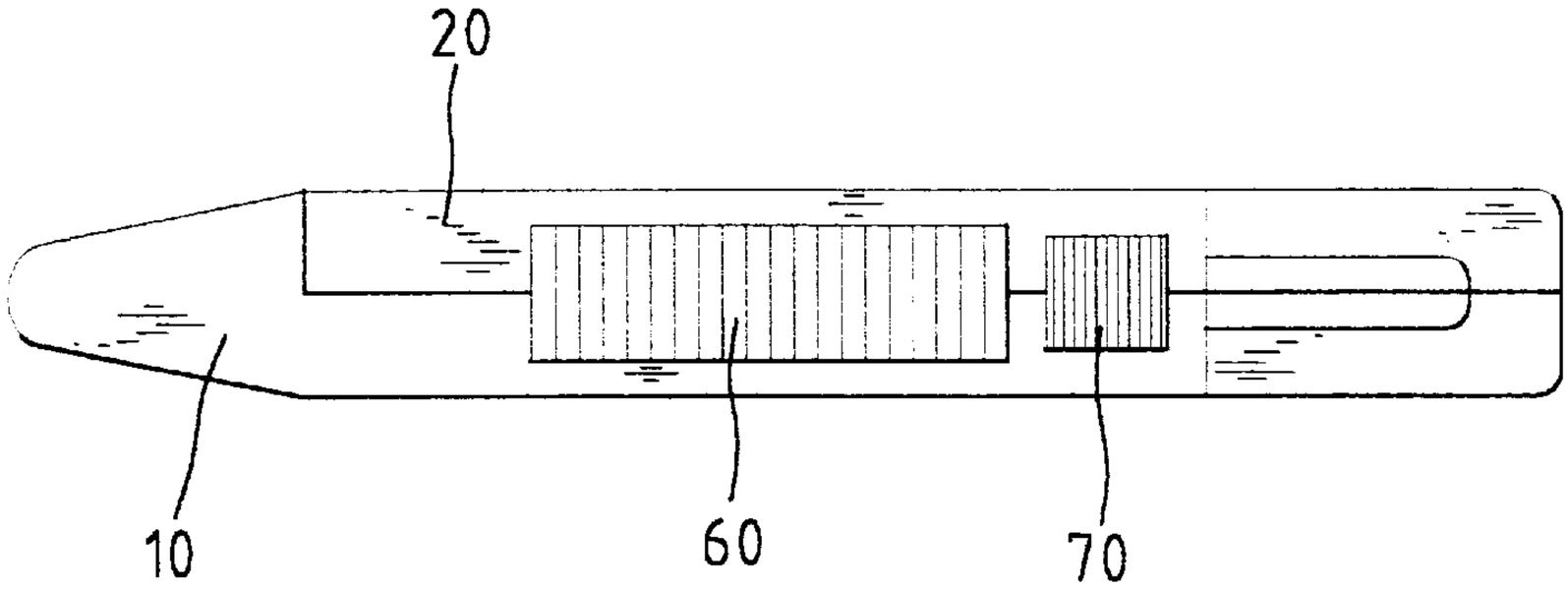


Fig 3

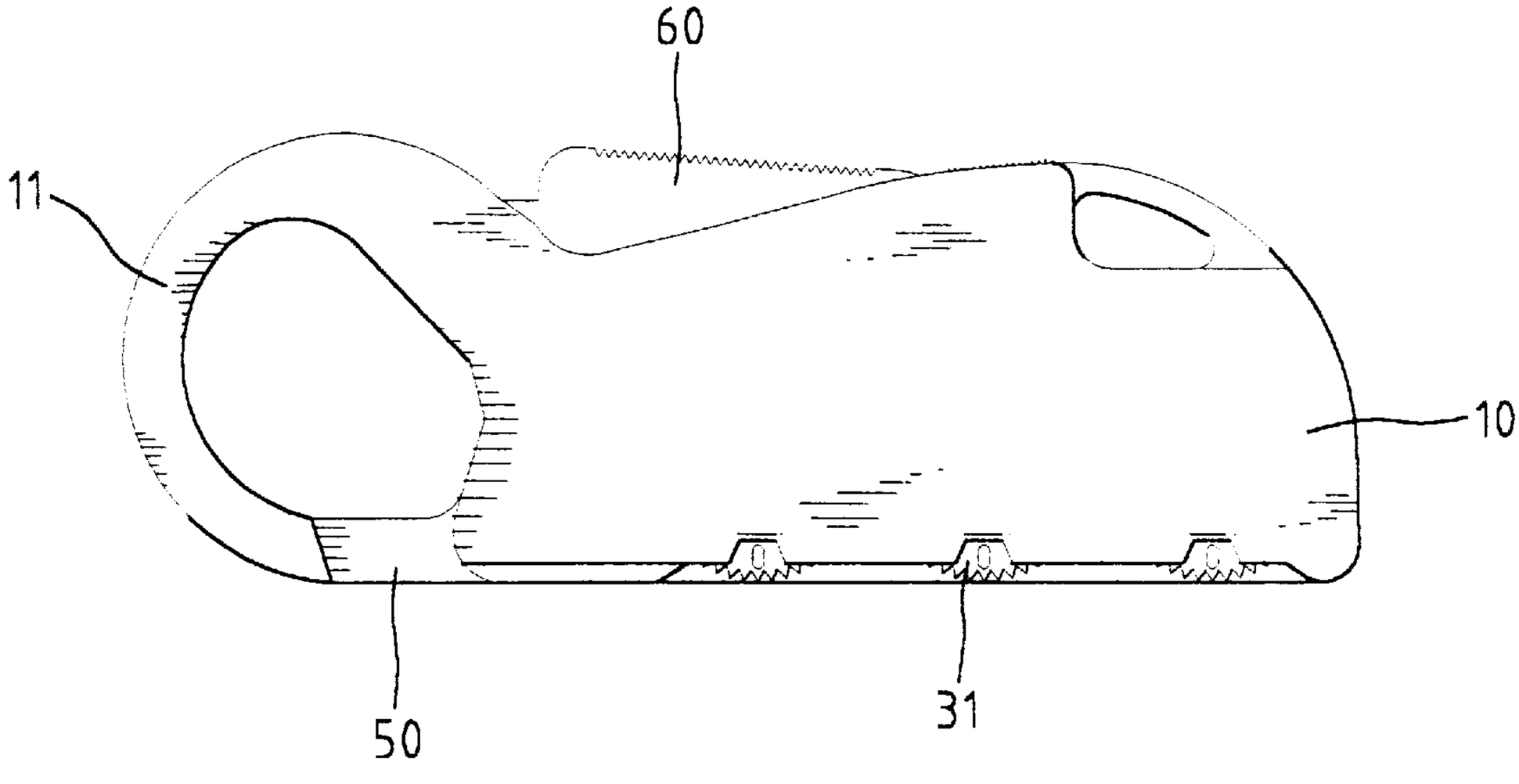
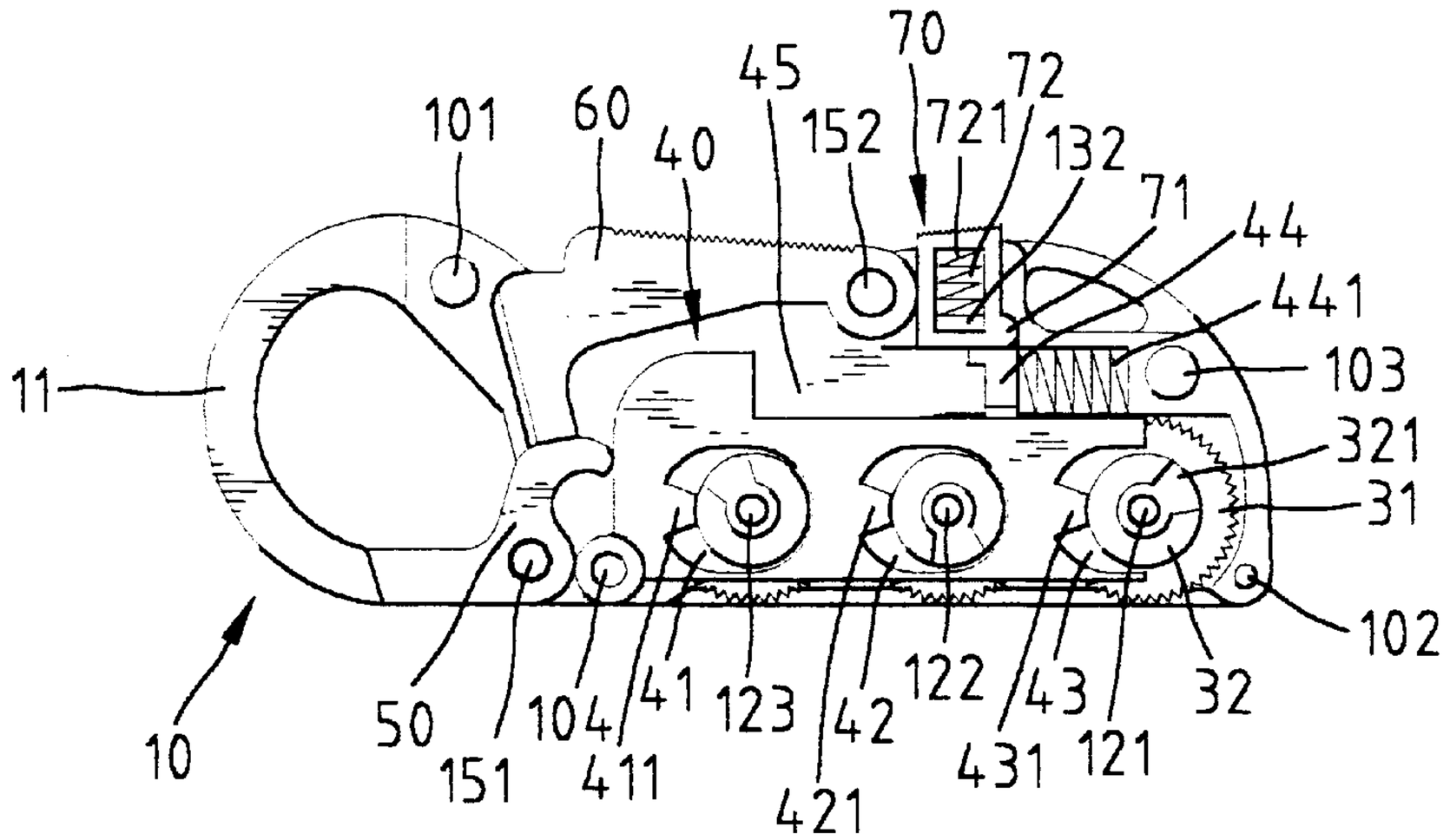


Fig 4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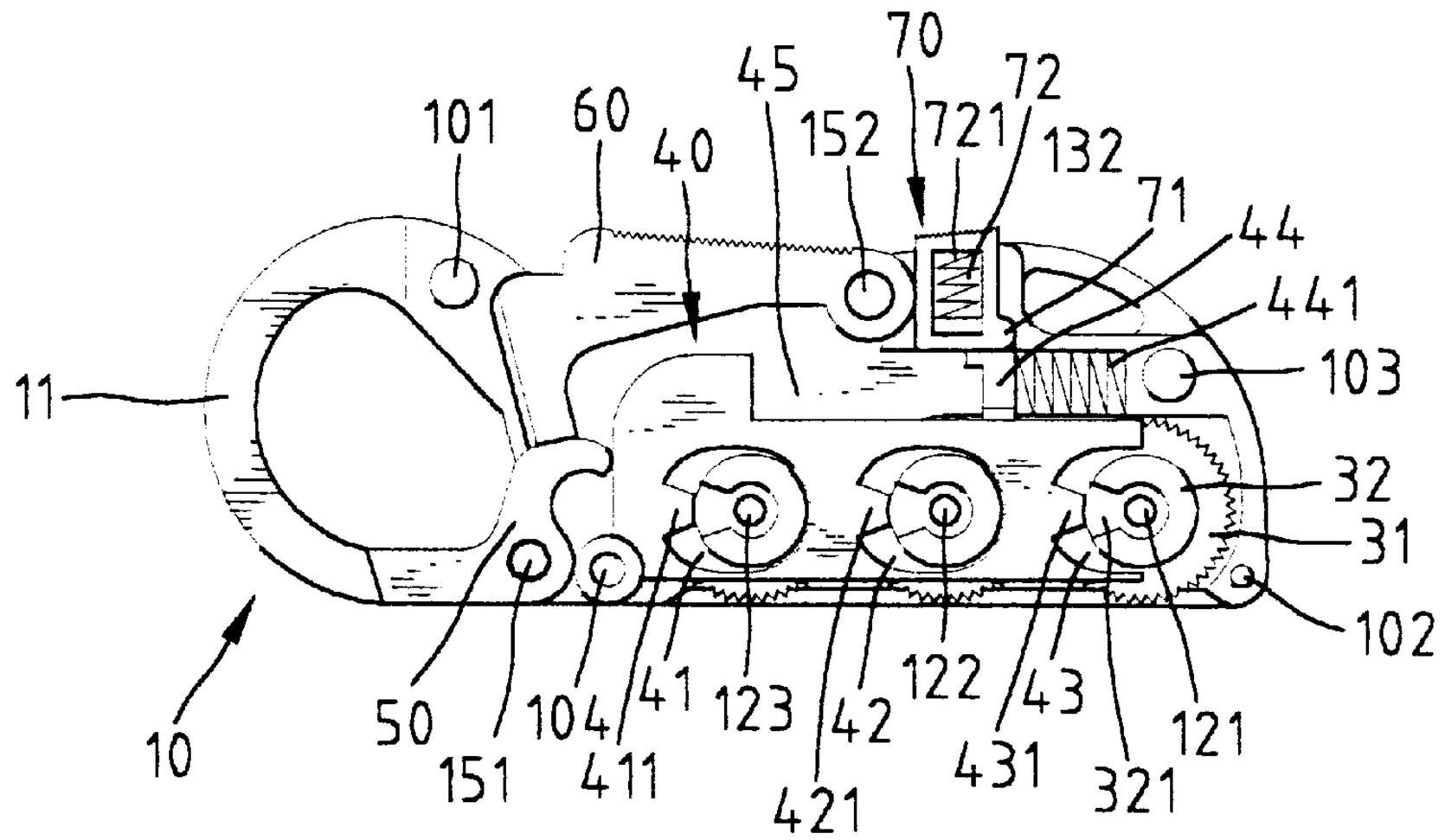
121
32

Fig 5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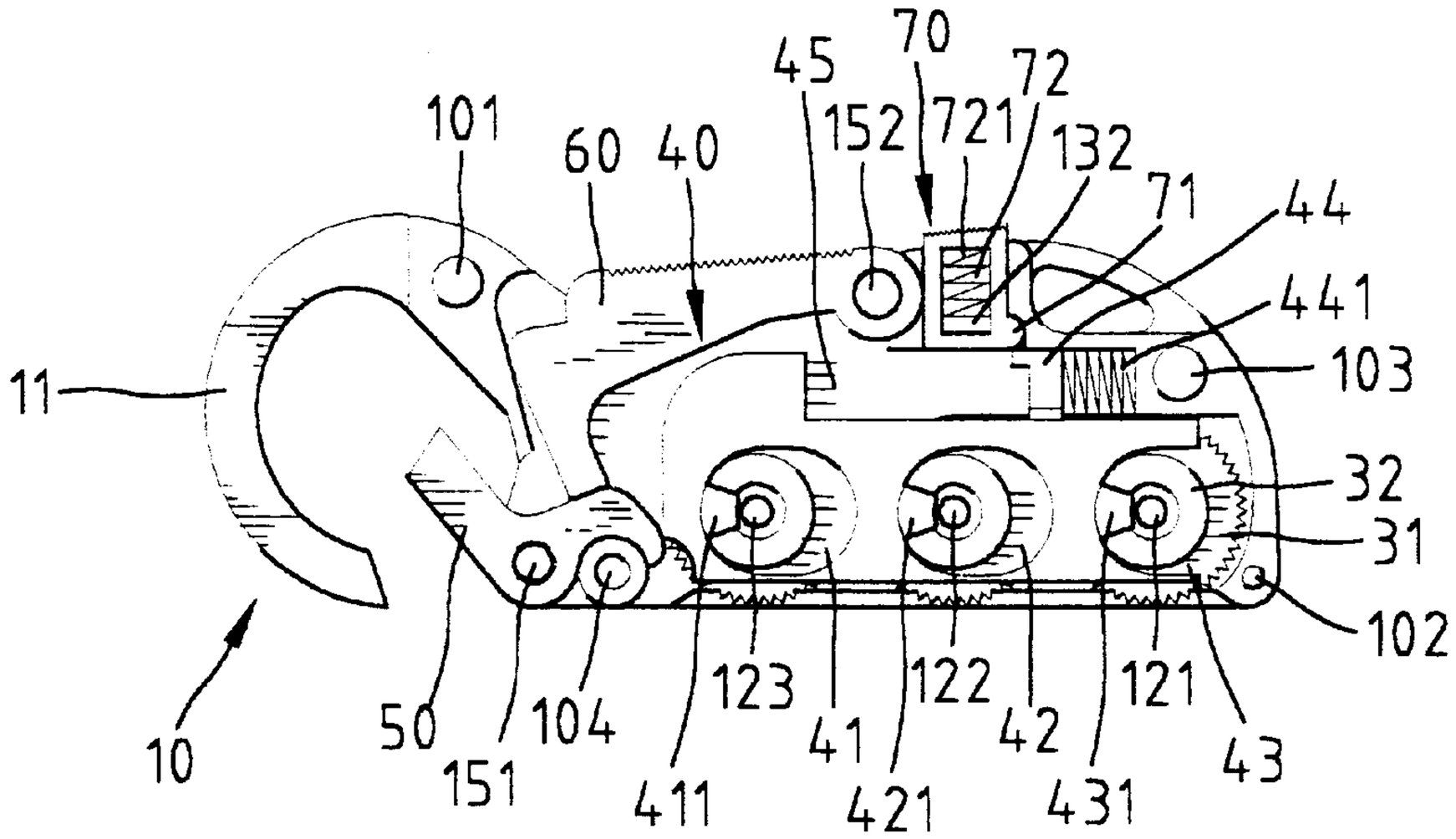
321
121

Fig 6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421
431
10

Fig 7

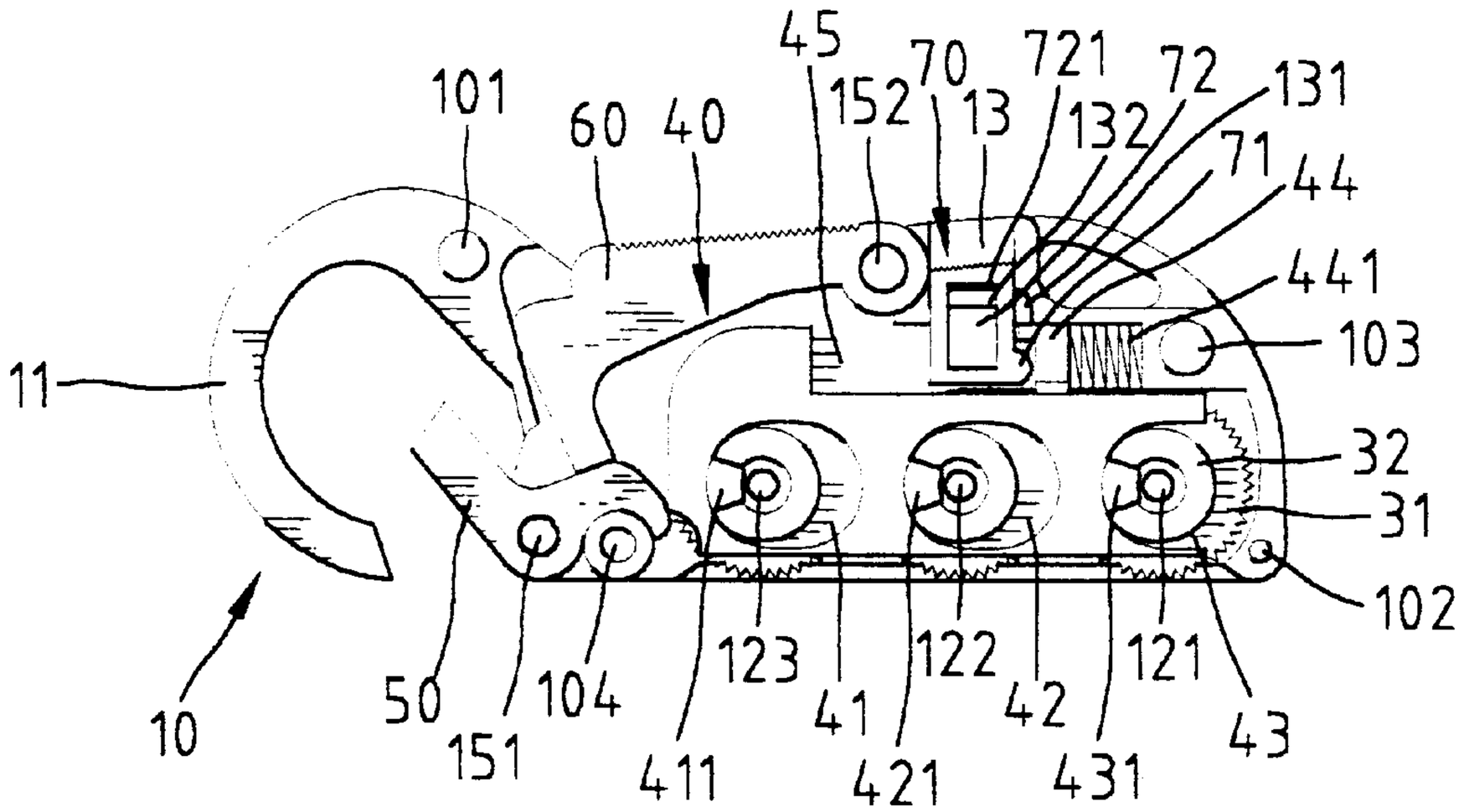
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Fig 8

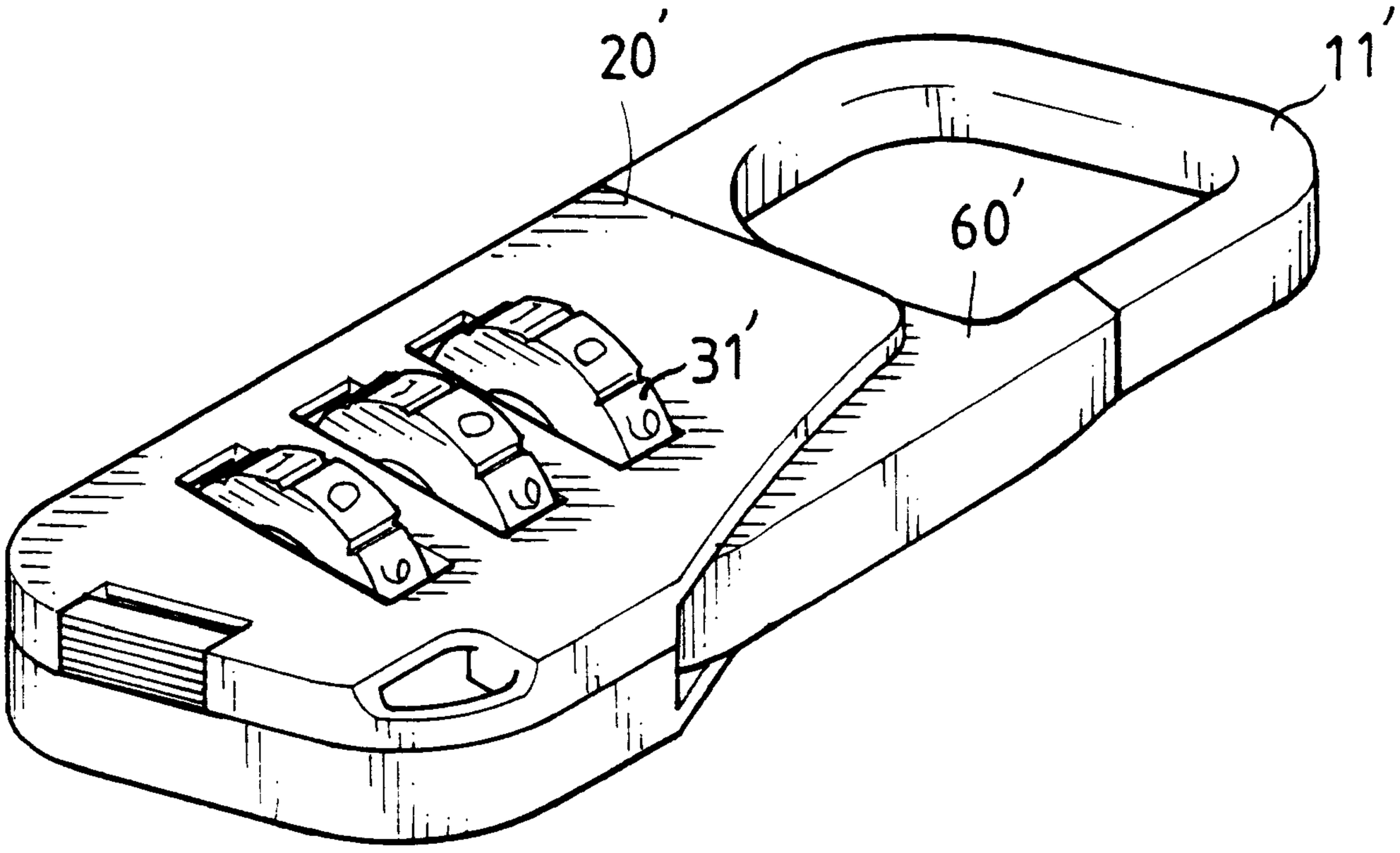
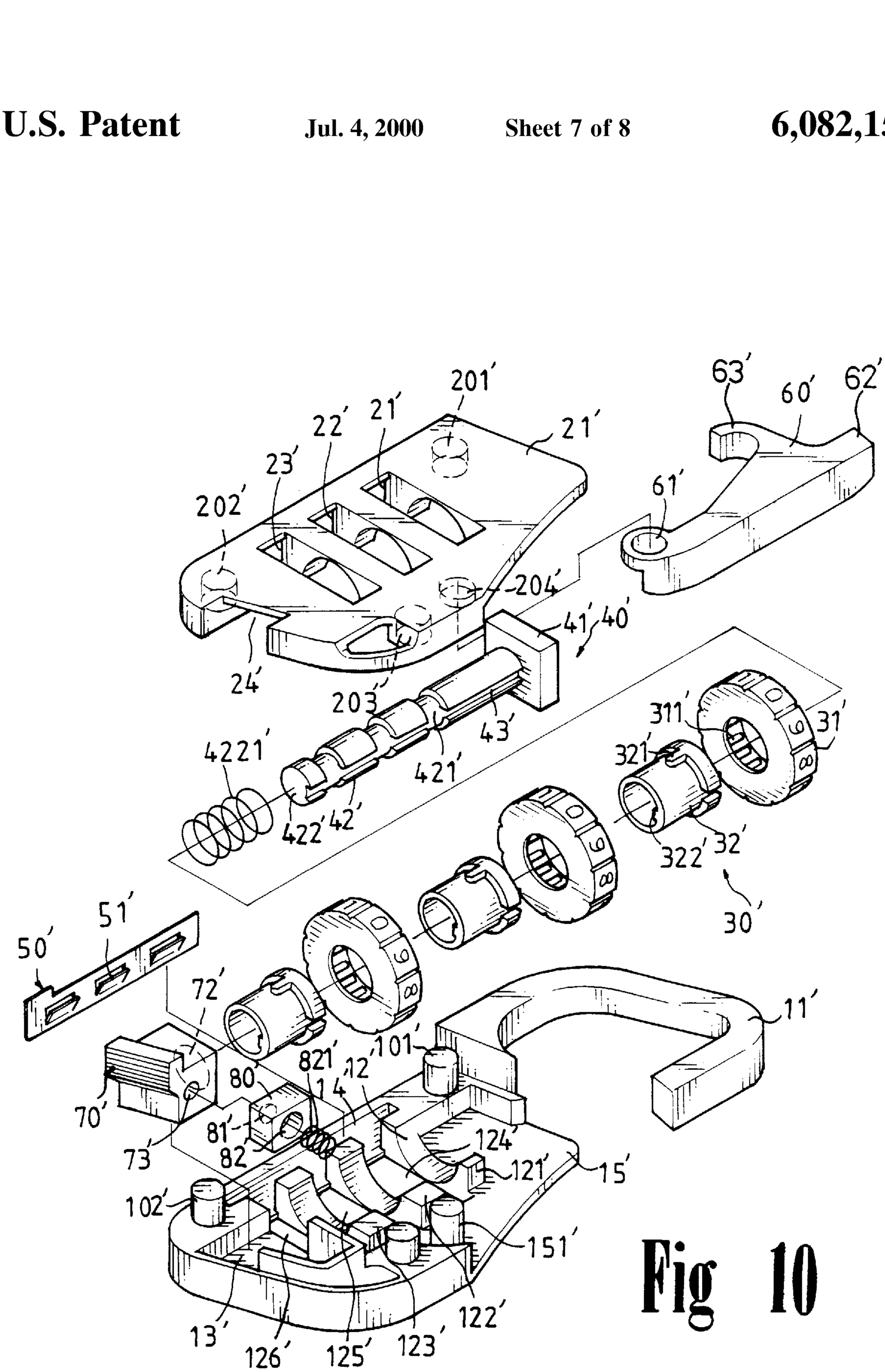


Fig 9


201'
22'
21'
21'
23'
202'
63'
60'
62'
61'
204'
41'
40'
24'
203'
43'
4221'
421'
422'
42'
311'
31'
321'
322'
32'
30'
50'
51'
72'
11'
101'
821'
12'
80
14
70'
81'
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73'
124'
121'
15'
102'
151'
122'
13'
126'
125'
123'

Fig 10

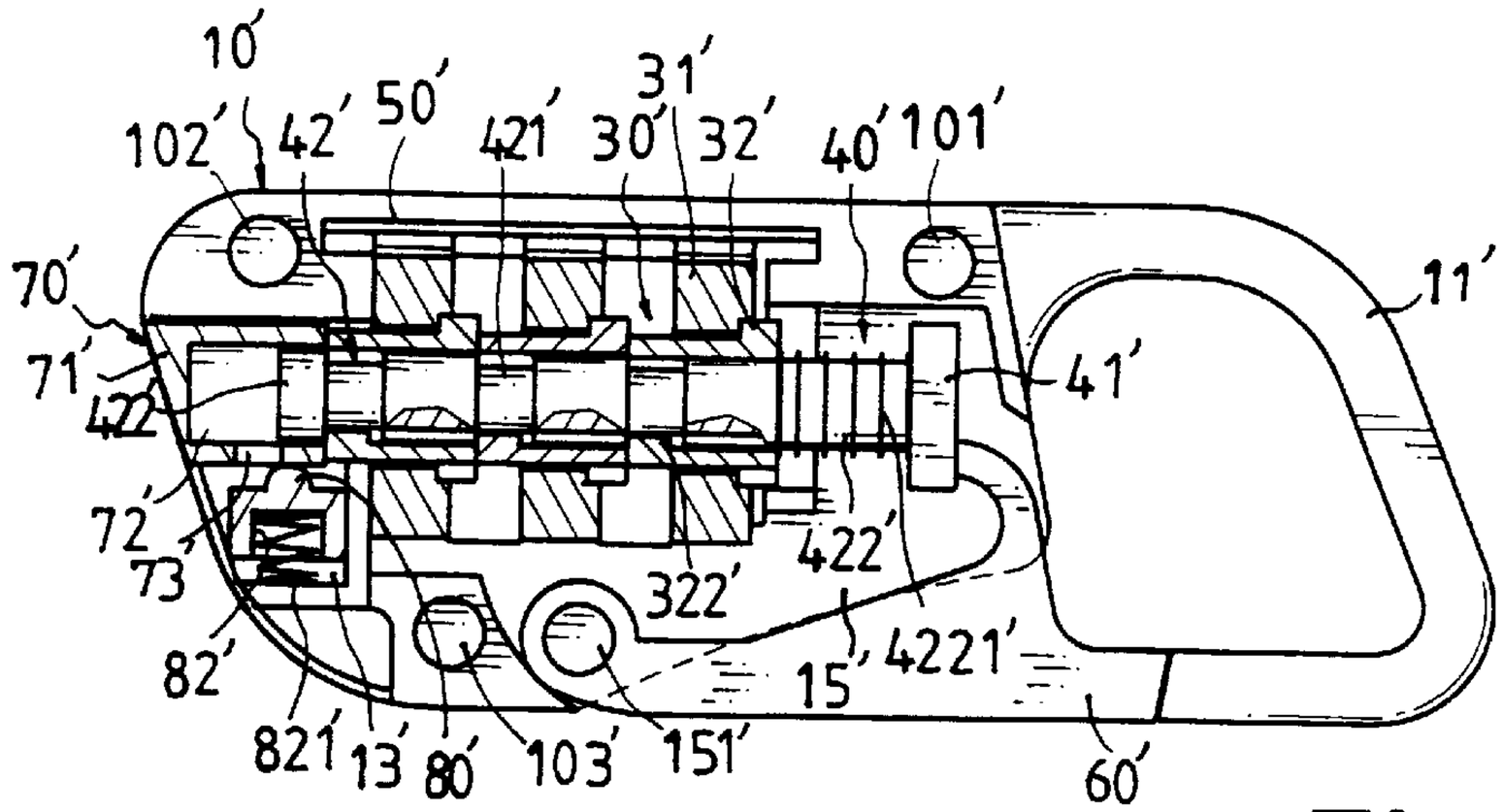

Fig 11

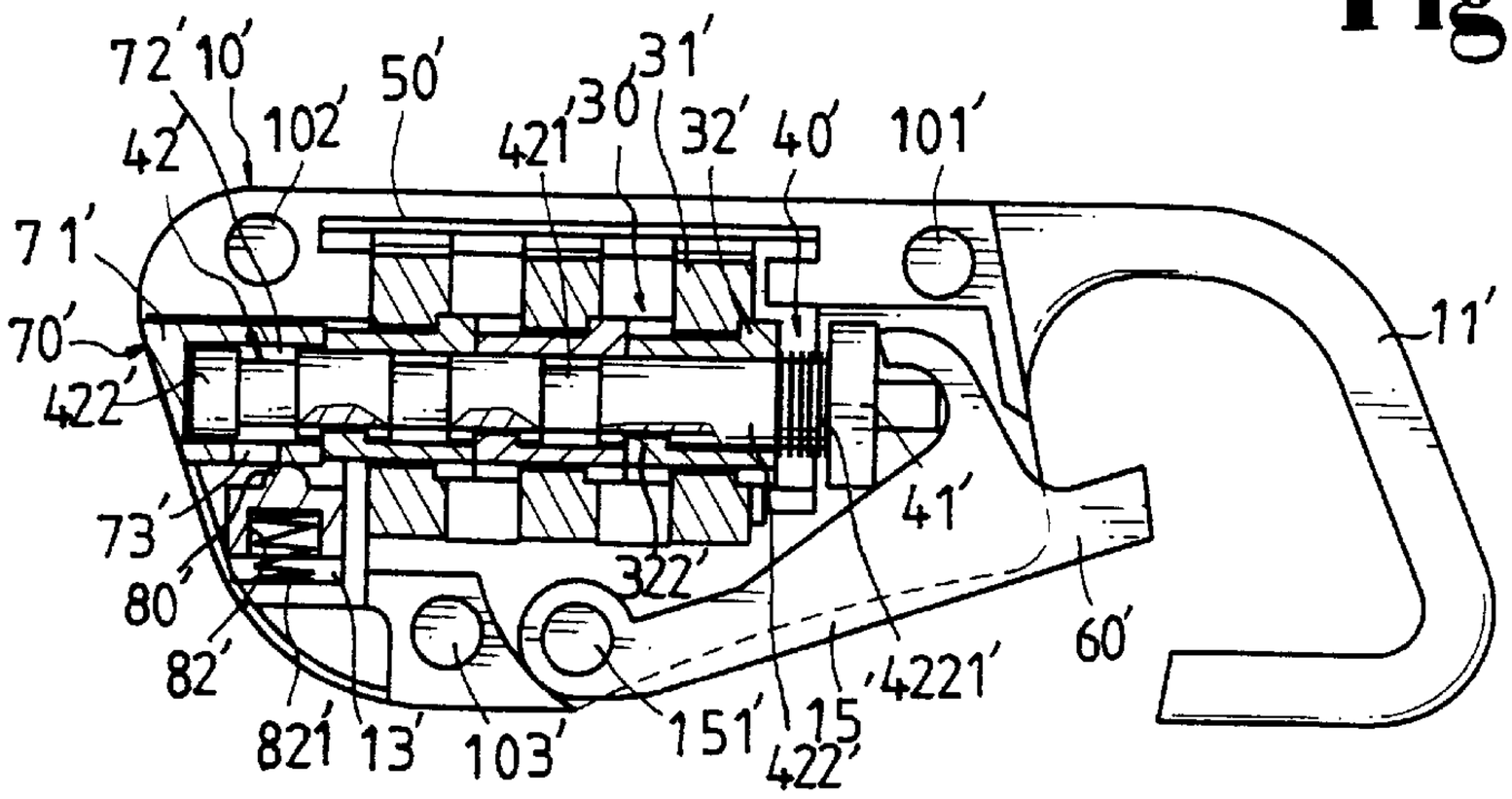

Fig 12

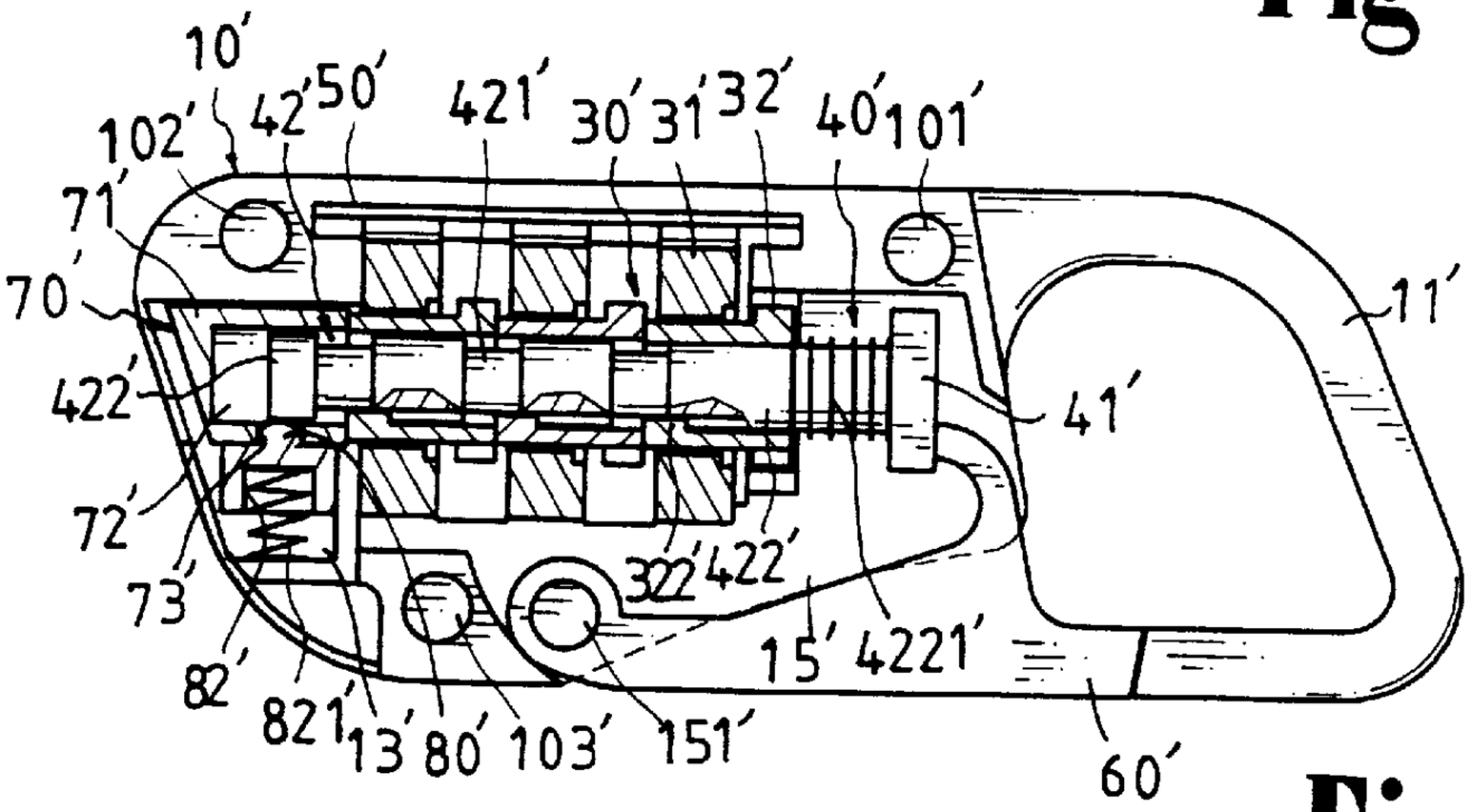

Fig 13

PAD LOCKS WITH CHANGEABLE CODE NUMBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to improved pad locks in which the code number thereof can be changed under simple operation.

2. Description of the Related Art

A pad lock of the type having several number wheels is changeable in the code number thereof. Conventionally, the user has to hold a sharp stick or the like by one hand and extend the sharp stick into a hole of the case to allow a change of the code number by the other hand. This is extremely inconvenient, as both hands are required while changing the code number. In addition, holding of the sharp stick is troublesome, An improved pad lock has been proposed to allow the user to continuously press a retaining member by one hand to allow a change of the code number by the other hand, yet such changing still requires both hands. The present invention is intended to provide improved pad locks to solve this problem.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide an improved pad lock with a code-changing button that can be pressed and retained in place to allow a change of the code number by one hand.

In accordance with the present invention, a pad lock comprises:

a casing including a hook extended outwards therefrom,

a plurality of number wheels rotatably mounted in the casing, each said number wheel being partially exposed outside the casing for manual turning, each said number wheel including a code wheel releasably engaged thereto to rotate therewith,

a locking means mounted in the casing and movable between a first position that retains the code wheels in place to allow free rotational movements of the number wheels for code number changing and a second position that disengages from the code wheels such that each said code wheel is engaged with an associated said number wheel to rotate therewith,

an unlocking member including a pivotal end pivotally mounted in the casing, a press end located outside the casing for manual pressing, an actuating end located in the casing and engaged with the locking means to move therewith, and a latch end located outside the casing and releasably engaged with the hook,

a code-changing button having an outer end outside the casing for manual pressing and an inner end releasably engaged with the locking means to retain the locking means in the first position, and

means for retaining the code-changing button in a position that engages with and thus retains the locking means in the first position.

In a preferred embodiment of the invention, the locking means includes an enlarged head and a stern extending from the enlarged head and having a first end adjacent to the enlarged head and a second end distal to the enlarged head. The stem includes a longitudinal groove defined in a periphery thereof and a plurality of annular grooves defined in the periphery thereof and adjacent to the second end thereof. Each code wheel is a sleeve that includes a protrusion formed on an inner periphery thereof. The stem is extended through the code wheels and the number wheels in a manner that the protrusion of each code wheel is received in an associated annular groove and not received in the longitudinal groove when the number wheels are not in a position that matches a correct code number such that the locking means is retained in the second position and not movable along a longitudinal direction. When the number wheels are rotated to the position that matches the correct code number, the protrusion of each code wheel is moved into the longitudinal groove such that the locking means is longitudinally movable from the second position to the first position upon a press on the press end of the unlocking member.

The casing may further comprise a plate mounted therein. The plate includes a plurality of elastic protrusions formed therein. Each elastic protrusion is engaged with an associated number wheel such that the associated number wheel is only rotatably in a single direction.

Each code wheel further includes a key formed on an outer periphery, and each number wheel includes an engaging groove defined in an inner periphery thereof for releasably engaging with the key on an associated code wheel. When the locking means is in the second position while the code-changing button is pressed, the key of each code wheel is disengaged from the engaging groove of an associated number wheel for code number changing.

The stem may further include a spring mounted around the first end thereof The spring has a first end attached to the enlarged head of the locking means and a second end attached to one of the code wheels for returning the code wheels to a position engaged with the number wheels when the code-changing button is pressed again.

The code-changing button includes a receptacle defined in a side thereof. The retaining means further includes a catch mounted in the casing and having a knurl and a spring. When the locking means is in the first position while the code-changing button is pressed, the receptacle is moved to a position in alignment with the knurl. In this case, the spring moves the catch toward the code-changing button and makes the knurl to be received in the receptacle to thereby retain the code-changing button in place.

In another preferred embodiment of the invention, the unlocking means includes:

a latch lever pivotally mounted in the casing and including the actuating end located in the casing and engaged with the locking means to move therewith and the latch end located outside the casing and releasably engaged with the hook, and

an unlocking member including the pivotal end pivotally mounted in the casing, the press end outside the casing for manual pressing, and the end engaged with the actuating end of the latch lever to move therewith.

Each code wheel includes a notch defined in a periphery thereof and the locking means includes a plurality of protrusions. Each protrusion is engaged with the notch of an associated code wheel when the locking means is in the first position while the code-changing button is pushed to thereby retain the locking means in the first position.

The casing includes a plurality of axle rods each for rotatably mounting an associated number wheel and the associated code wheel. Each axle rod further includes a spring mounted therearound for biasing the associated code wheel toward the associated number wheel to rotate therewith.

The casing includes a wall formed on an inner periphery thereof The code-changing button includes a slot therein for receiving the wall. A spring is received in the slot and has a

first end attached to the wall and a second end attached to an end wall that defines the slot. The locking means includes an engaging element, and the code-changing button further includes an arcuate protrusion formed on an outer periphery thereof for releasably engaging with the engaging element of the locking means. The locking means includes an engaging chamber that aligns with the arcuate protrusion when the locking means is in the first position.

Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a first embodiment of a pad lock in accordance with the present invention;

FIG. **2** is an exploded perspective view of the pad lock in FIG. **1**;

FIG. **2A** is a perspective view illustrating an underside of an upper casing of the pad lock in FIG. **2**;

FIG. **3** is a view of the pad lock in FIG. **1**;

FIG. **4** is a top view, in an upside-down status, of the pad lock in FIG. **1**;

FIG. **5** is a top view similar to FIG. **4**, with the upper casing removed to illustrate the inner structure, in which the number wheels of the pad lock are in a locked position;

FIG. **6** is a top view similar to FIG. **5**, in which the number wheels of the pad lock are in an unlocked position,

FIG. **7** is a top view similar to FIG. **6**, illustrating unlocking of the pad lock;

FIG. **8** is a top view similar to FIG. **7**, illustrating code changing of the pad lock;

FIG. **9** is a perspective view of a second embodiment of the pad lock in accordance with the present invention;

FIG. **10** is an exploded perspective view of the pad lock in FIG. **9**;

FIG. **11** is a top view, partly sectioned, of the pad lock in FIG. **9**, in which the pad lock is in a locked status;

FIG. **12** is a top view similar to FIG. **11**, in which the pad lock is in an unlocked status; and

FIG. **13** is a top view similar to FIG. **11**, in which the pad lock is in a status that allows code number changing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and initially to FIGS. **1** and **2**, a pad lock in accordance with the present invention generally includes a lower casing **10**, a number wheel assembly **30**, a locking plate **40**, a latch lever **50**, an unlocking member **60**, a code-changing button **70**, and an upper casing **20**. The lower casing **10** includes a number of pegs **101**, **102**, **103** and a holed peg **104** formed on an upper side thereof for engaging with a number of receptacles **201**, **202**, **203** and a peg **204** (FIG. **2A**) formed on an underside of the upper casing **20**. The lower casing further includes a hook **11** formed on an end thereof and not covered by the upper casing **20**. The upper side of the lower casing **10** further includes a first recessed section **12** formed thereon. A number of axle rods **121**, **122**, and **123** are formed on the first recessed section **12**. Each axle rod **121**, **122**, **123** has a number wheel **31** and a code wheel **32** rotatably mounted thereon and a spring **33** mounted therearound, each code wheel **32** having a notch **321** defined in a periphery thereof; which will be described later.

The upper side of the lower casing **10** further includes a compartment **13** with an arcuate extension **131**. A wall **132** is formed on the upper side of the lower casing **10** and located inside the compartment **13**. The code-changing button **70** is partially, slidably received in the compartment **13** and has s slot **72** defined therein for receiving the wall **132** and a spring **721** that has a first end attached to the wall **132** and a second end attached to an end wall that defines the slot **72**. The code-changing button **70** further includes an arcuate protrusion **71** received in the arcuate extension **131** of the compartment **13** to prevent from disengaging of the code-changing button **70**. A recess **14** is defined between the wall **132** and the first recessed section **12**, which will be described later.

The upper side of the lower casing **10** further includes a second recessed section **15** that has two spaced axle rods **151**, **152** formed thereon. The latch lever **50** includes a hole **51** at a mediate section thereof for receiving the axle rod **151** to allow pivotal movement of the latch lever **50**. The unlocking member **60** includes a hole **61** defined in an end thereof for receiving the axle rod **152** to allow pivotal movement of the unlocking member **60**.

The locking plate **40** is mounted between the upper and lower casings **20** and **10** and includes two holes **41** and **42** and a notch **43**. Each hole **41**, **42** has a lug **411**, **421** projecting from a periphery thereof, while the notch **43** has a lug **431** projecting from an arcuate wall thereof The locking plate **40** further includes an engaging element **44** formed on a lateral side thereof and movable in the recess **14** of the lower casing **10**. A retaining chamber **45** is defined in the locking plate **40** for releasably retaining the code-changing button **70**.

FIG. **3** illustrates a front view of the assembled pad lock of the present invention, while FIG. **4** illustrates a top view of the pad lock.

Referring to FIG. **5**, when at least one of the notches **321** is not aligned with the associated lug **411**, **421**, **431**, a second end of the unlocking member **60** that is distal to the first pivoted end (see **152**) cannot be pressed, as at least one of the lugs **411**, **421**, and **431** are stopped by the code wheels **32** such that the locking plate **40** cannot be moved rightwards for unlocking. Referring to FIG. **6**, after turning the number wheels **31** to the correct angular positions (the code number is matched), each notch **321** faces the associated lug **411**, **421**, **431**. The unlocking member **60** can be pressed at the second end to actuate an actuating end of the latch lever **50** that engages with the second end of the unlocking member **60**. The latch lever **50** pivots about the axle rod **151**, wherein the actuating end of the latch lever **50** moves the locking plate **40** rightwards and thus makes the lugs **411**, **421**, and **431** to be received in the notches **32**, while a latch end of the latch lever **50** is disengaged from the hook **11**, best shown in FIG. **7**. Thus, the pad lock is in an unlocked status.

Under the unlocked status shown in FIG. **7**, the code-changing button **70** aligns with the engaging chamber **45** of the locking plate **40**. The user may push the code-changing button **70** to make the arcuate protrusion **71** engage with the engaging chamber **45** and thus retained in place by the engaging element **44**, as shown in FIG. **8**. The user may turn the number wheels **31** and thus change the code number as the code wheels **32** are retained in place by means of engagement between the notches **321** and the lugs **411**, **421**, and **431**. The code changing procedure can be accomplished by a single hand. When the code-changing button **70** is pressed again, the spring **721** returns the code-changing button **70** to a position shown in FIG. **7** to allow normal

operation of the pad lock. Thus, the code number changing operation is easy when compared to the prior art pad locks.

FIGS. **9** and **10** illustrate a second embodiment of pad lock in accordance with the present invention. The pad lock includes a lower casing **10'**, a number wheel assembly **30'**, a locking means **40'**, an elastic plate **50'**, an unlocking member **60'**, a code-changing button **70'**, and an upper casing **20'**. The lower casing **10'** includes a number of pegs **101'**, **102'**, and **103'** formed on an upper side thereof for engaging with a number of receptacles **201'**, **202'**, and **203'** formed on an underside of the upper casing **20'**. The lower casing **10'** further includes a hook **11'** formed on an end thereof and not covered by the upper casing **20'**. The upper side of the lower casing **10'** further includes a first recessed section **12'** formed thereon. A number of U-shaped seats **121'**, **122'**, and **123'** are formed on the first recessed section **12'** to thereby define a plurality of number wheel compartments **124'**, **125'**, and **126'** therebetween for receiving with the number wheel assembly **30'**.

The upper side of the lower casing **10'** further includes a substantially trapezoid compartment **13'**. The code-changing button **70'** is partially, slidably received in the compartment **13'** and has a press end **71'** exposed outside the upper and lower casings **20'** and **10'** for manual operation. The code-changing button **70'** includes a longitudinal receptacle **72'** defined therein and a transverse hole **73'** extended in a lateral side and communicated with the longitudinal receptacle **72'**. A catch **80'** is received in the compartment **13'** and includes a knurl **81'** releasably engaged with the button **70'**. The catch **80'** further includes a receptacle **82'** defined therein for partially receiving a spring **821'** for returning the catch **80'**, which will be described later. A further compartment **14'** is defined between an outer peripheral wall of the lower casing **10'** and the first recessed section **12'** for receiving an elastic plate **50'** with a number of elastic protrusion **51'**, which will be described later.

The upper side of the lower casing **10'** further includes a second recessed section **15'** that has an axle rod **151'** formed thereon. The unlocking member **60'** includes a hole **61'** defined in an end thereof for receiving the axle rod **151'** to allow pivotal movement of the unlocking member **60'**. The unlocking member **60'** further includes a latch end **62'** that may either cooperate with the hook **11'** to form a closed space when in a locked position or move to an unlocked position that is disengaged with the hook **11'**. The unlocking member **60'** firer includes an actuating end **63'**, which will be described later.

The number wheel assembly **30'** includes a plurality of number wheels **31'** rotatably received in the number wheel compartments **124'**, **125'**, and **126'** respectively. Each number wheel **31'** is mounted around a sleeve-like code wheel **32'** that has a key **321'** releasably engaged with an engaging groove **311'** defined in an inner periphery of a central hole of the number wheel **31'**. Each code wheel **32'** includes a protrusion **322'** formed on an inner periphery thereof Each elastic protrusion **51'** on the plate **50'** contacts with an outer periphery of an associated number wheel **31'** in a manner that the number wheel **31'** is only rotatable in a single direction.

The locking means **40'** includes an enlarged head **41'** engaged with the actuating end **63'** of the unlocking member **60'** and a stem **42'** extending from the enlarged head **41'**. The stem **42'** includes a longitudinal groove **43'** and a number of longitudinally spaced annular grooves **421'** defined in an outer periphery of an end **423'** distal to the enlarged head **41'**. The other end **422'** of the stem **42'** has a spring **4221'** mounted therearound and between the enlarged head **41'** and an outermost code wheel **32'** that is adjacent to the enlarged head **41'**. The annular grooves **421'** respectively receive the protrusions **322'** of the code wheels **32'**, which will be described later. The upper casing **20'** includes a number of slots **21'**, **22'**, and **23'** arranged in a manner that a portion of each of the number wheels **31'** is accessible via an associated slot **21'**, **22'**, **23'** to allow manual rotation. The upper casing **20'** further includes a recess **204'** for receiving an upper end of the axle rod **151'** to prevent from disengagement of the unlocking member **60'** from the axle rod **151'**. The upper casing **20'** further includes a notch **24'** through which the press end **71'** of the code-changing button **70'** is extended outside for manual pressing.

The number wheels **31'** in FIG. **11** are not in the unlocked position, in which at least one of the protrusions **322'** in the code wheels **32'** is received in the annular grooves **421'** but not in the longitudinal groove **431'** such that the locking means **40'** is not movable along a longitudinal direction thereof. As a result, the unlocking member **60'** cannot be pressed for unlocking.

Referring to FIG. **12**, if the number wheels **31** are rotated to a position that matches the correct code number the protrusion **322'** of each code wheel **32'** is rotated to an intersection of the associated annular groove **421'** and the longitudinal groove **431'**. Thus, the locking means **40'** is movable along its longitudinal direction and thus allows pressing of the unlocking member **60'**. It is appreciated that, upon pressing the unlocking member **60'**, the actuating end **63'** of the unlocking member **60'** makes the locking means **40'** slide leftwards (see FIG. **12**) while the latch end **62'** of the unlocking member **60'** disengages from the hook **11'** to thereby achieve the unlocking purpose.

Still referring to FIG. **12**, when code number changing is required, the user may push the code-changing button **70'** and thus make the leftmost one of the code wheel **32'** move rightwards. The receptacle **73'** of the button **70'** becomes in alignment with the knurl **81'** of the catch **80'** and thus receives the knurl **81'** as the catch **80'** is moved toward the button **70'** under the action of the spring **821'**. As a result, the button **70'** is retained in place. The key **321'** on each code wheel **32'** that is originally received in engaging groove **311'** of the associated number wheel **31'** disengages from the engaging groove **311'**, as the code wheels **32'** are moved longitudinally relative to the number wheels **31'**. As a result, the number wheels **31'** are freely rotatable without rotating the code wheels **32'**. Namely, the user may turn the number wheels **31'** and thus change the code number. Pressing the button **70'** again may cause disengagement of the knurl **81'** of the catch **80'** from the receptacle **73'** of the button **70'** and thus allows returning of the button **70'** and the code wheels **32'**. Thus, the keys **321'** of the code wheels **32'** are returned to engage with the engaging grooves **311'** of the number wheels **31'** to move therewith. Accordingly, the code number changing procedure can be completed by a single hand, and the pad lock can be unlocked only when the number wheels **31'** are rotated to a position that matches the correct code number.

Although the invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A pad lock, comprising:

a casing including a hook extended outwards therefrom;

a plurality of number wheels rotatably mounted in the casing, each said number wheel being partially exposed outside the casing for manual turning, each said number wheel including a code wheel releasably engaged thereto to rotate therewith;

a locking means mounted in the casing and movable between a first position that retains the code wheels in place to allow free rotational movements of the number wheels for code number changing and a second position that disengages from the code wheels such that each said code wheel is engaged with an associated said number wheel to rotate therewith;

an unlocking means including a pivotal end pivotally mounted in the casing, a press end located outside the casing for manual pressing, an actuating end located in the casing and engaged with the locking means to move therewith, and a latch end located outside the casing and releasably engaged with the hook;

a code-changing button having an outer end outside the casing for manual pressing and an inner end releasably engaged with the locking means to retain the locking means in the first position, and;

means for retaining the code-changing button in a position that engages with and thus retains the locking means in the first position, wherein the locking means includes an enlarged head and a stem extending from the enlarged head and having a first end adjacent to the enlarged head and a second end distal to the enlarged head, the stem including a longitudinal groove defined

in a periphery thereof and a plurality of annular grooves defined in the periphery thereof and adjacent to the second end thereof, each said code wheel being a sleeve that includes a protrusion formed on an inner periphery thereof, the stem being extended through the code wheels and the number wheels in a manner that the protrusion of each said code wheel is received in an associated said annular groove and not received in the longitudinal groove when the number wheels are not in a position that matches a correct code number such that the locking means is retained in the second position and not movable along a longitudinal direction, and wherein when the number wheels are rotated to the position that matches the correct code number, the protrusion of each said code wheel is moved into the longitudinal position to the first position upon a press on the press end of the unlocking member, wherein the code-changing button includes a receptacle defined in a side thereof, and the retaining means further includes a catch mounted in the casing and having a knurl and a spring, wherein the locking means is in the first position while the code-changing button is pressed, the receptacle is moved to a position in alignment with the knurl, and the spring moves the catch toward the code-changing button and makes the knurl be received in the receptacle to thereby retain the code-changing button in place.

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